1.0 Project Description

1.1 Project Background

On September 30, 2002, the City of Baltimore (City) entered into a Consent Decree with the U.S. Environmental Protection Agency (EPA), the U.S. Department of Justice (DOJ) and the Maryland Department of the Environment (MDE) to eliminate wet weather sanitary sewer overflows. In accordance with the Consent Decree, the City of Baltimore Department of Public Works began collection system evaluation and sewershed studies of the entire wastewater collection system (as defined in Article VI Remedial Measures, Paragraph 9 of the Consent Decree). In June of 2007, the City contracted with URS Corporation (URS) to complete an evaluation study for the Gwynns Falls Sewershed. This study report details the evaluation of the Gwynns Falls Sewershed, one of eight Baltimore City sewersheds.

The Gwynns Falls Sewershed Study, City of Baltimore Project 1032, consists of various investigative and analytical activities as required by the Consent Decree, including:

i. Flow monitoring data analysis
ii. Sewer manhole inspection
iii. Sewer closed circuit television (CCTV) video inspection
iv. Smoke testing
v. Dye flood and dyed-water testing
vi. Updating the City's wastewater Geographic Information System (GIS)
vii. Water-In-Cellar complaint review
viii. Projection of current and future base sanitary flow
ix. Preparation, calibration, and validation of a hydraulic model
x. Critical sewer system component identification
xi. Condition assessment and criticality rating of the sewer collection system components
xii. Development of a long-term rehabilitation and corrective action plan
xiii. Cost estimate preparation

The Gwynns Falls Sewershed includes approximately 980,000 linear feet (lf) of gravity sewer ranging from 6- to 102-inches in diameter, approximately 5,200 public sector manholes, 4 sets of inverted siphons, the Westport Pump Station and 200-lf of associated force main, the Maidens Choice Pressure Sewer; and the Southwest Diversion Pressure Sewer.

The sewershed study elements are defined in the Paragraph 9.C of the Consent Decree and are summarized as follows:

i. Evaluation of the effectiveness of completed and proposed sanitary sewer projects (identified in Paragraph 8.B of the Consent Decree)
ii. Identification of sewer collection deficiencies discovered during inspections
iii. Identification of rehabilitation and other corrective actions performed by the City to address deficiencies identified in Item ii
iv. Recommendation of proposed rehabilitation and other corrective actions, developed in accordance with guidance provided by the City, to address deficiencies identified in Item ii
v. Description of decision making criteria for selection of future corrective action

vi. Development of a plan and schedule for future wastewater collection system evaluation
vii. Development of a plan and schedule for implementation of rehabilitation and other corrective action deemed to be necessary to address deficiencies identified in Item ii or to ensure adequate operation of the wastewater collection system
viii. Preparation of a prioritization plan for the proposed corrective actions identified in Item vii
ix. Preparation of cost estimates for proposed corrective actions identified in Item vii
x. Preparation of a plan and schedule for eliminating physical connections between sanitary sewer and storm drains
xi. Determination of storm event range for which peak flows can be conveyed without occurrence of sanitary sewer overflows (SSOs) in the existing wastewater collection system
xii. Identification of model components that have the potential to cause or contribute to overflows
xiii. Determination of the range of storm events for which peak flows can be conveyed without occurrence of SSOs once the recommended construction projects are in place
xiv. Presentation of rainfall and flow monitoring analysis results
xv. Description of the quality assurance and quality control analyses performed for various field activities
xvi. Quantification of inflow and infiltration (I/I) and identification of I/I sources
xvii. Description of additional data collection activities that will continue after completion of rehabilitation and corrective action identified in Item vii
xviii. Certification that the GIS is functional in accordance with Paragraph 14.B of the Consent Decree

The content and structure of this Sewershed Study Report have been established to address each of the sewershed study and plan elements required under the Consent Decree.

1.2 Previous Study

Prior to the Consent Decree, a Gwynns Falls sewershed study (City of Baltimore Project 8509), was completed by URS, under contract with the City. This study included flow metering, hydraulic modeling and limited field investigations. The pipe and node data recorded in the hydraulic model was developed based on available record drawings and information provided by the City of Baltimore Wastewater Analyzer's Office. This model was later updated by the City's Technical Consultant using field data and available record drawings.

1.3 Purpose of Sewershed Study

The Gwynns Falls Sewershed study contributes to the City's compliance with the Clean Water Act and Title 9, Subtitle 3 of the Environment Article, Annotated Code of Maryland and the regulations promulgated thereunder, and all terms and conditions of the Back River and Patapsco WWTPs' National Pollutant Discharge Elimination System (NPDES) permits. Sanitary Sewer overflows and dry weather overflows have been evaluated for elimination in the Gwynns Falls Sewershed collection system through development and implementation of the measures set forth in Paragraphs 8 through 15 of the Consent Decree. Construction projects 17 through 22, as identified in Appendix D of the Consent

Decree, have been completed by the City. All SSO structures listed in Appendix C of the Consent Decree have been eliminated. Illegal stormwater or sewer connections have been identified and proposed for elimination. Potential rainfall-dependent infiltration and inflow (RDII) sources from privately owned customer service laterals have been identified through an extensive smoke test program. The City's GIS has been updated to be accurate, fully functional and capable of displaying the information described in Paragraph 14, Items b.i through iv of the Consent Decree.

1.4 Description of the Sewershed and Sub-Basins

The Gwynns Falls Sewershed is one of eight sanitary sewersheds located within the City, as shown in Figure 1.4.1. The sewershed is located in the west side of the City and extends north and west into Baltimore County; however, the study area covers only that portion of the sewershed located within the City limits, approximately 13.1 square miles. The majority of the sewershed's land usage is residential; however, there are commercial corridors located along the primary and arterial routes as well as significant amounts of City owned parkland in the central portion of the sewershed.

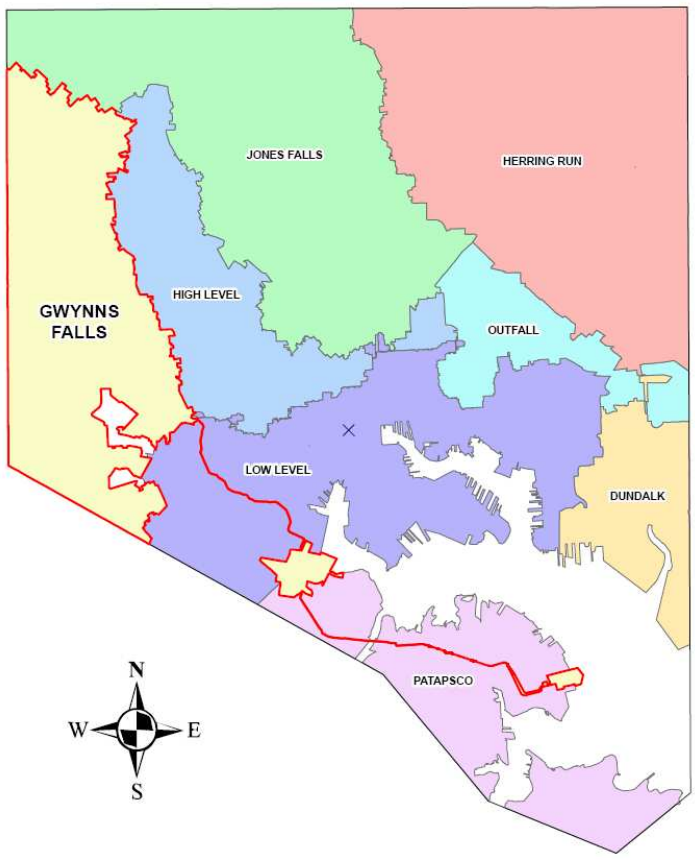

Figure 1.4.1 - Location Map

The sanitary collection system conveys flow to the Patapsco WWTP. However, flow can be diverted to the Back River WWTP via the Baltimore Street or Primson Avenue diversion chambers.

The Gwynns Falls sewershed consists of 6 sub-sewersheds. The boundaries for each of the sub-sewersheds are depicted on Figure 1.4.2. The Gwynns Falls sewershed is unique amongst other sewersheds because it includes City assets that are not located within its boundaries. Besides the 6 sub-sewersheds, the Gwynns Falls sewershed jurisdiction includes two interceptors, the Maidens Choice Pressure Sewer and the South West Diversion, which convey sanitary sewer flow from the sewershed to the Patapsco WWTP. Moreover, the Gwynns Falls sewershed includes PA-13, a sub-basin which is outside of its main boundaries and that contributes sanitary sewer flow to the South West Diversion through the Westport Pump Station and its corresponding pressure main. A brief description of the primary interceptor serving each of the 6 sub-sewersheds and the assets outside of the main sewershed boundaries is provided below:

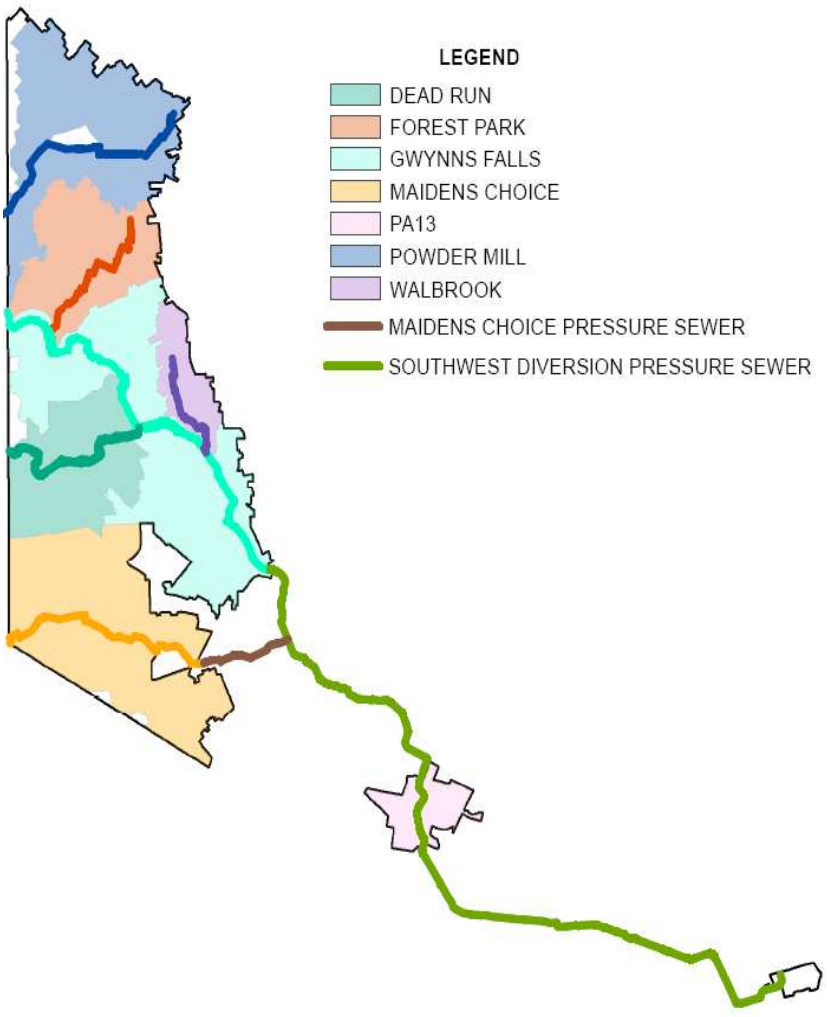

Figure 1.4.2 – Sub-sewershed Boundaries with

The **Main Gwynns Falls Interceptor (GF)** is the primary interceptor within the Gwynns Falls; it extends from the City boundary with Baltimore Country to the Baltimore Street diversion at the High Level sewershed boundary where it discharges the conveyed flow onto either the South West Diversion or the High Level interceptor. The Main GF Interceptor receives all sanitary sewer flow from the Powder Mill, Forrest Park, Walbrook, and Dead Run sub-sewersheds, conveying the majority of all sanitary sewer flow generated by the sewershed, as well as the majority of the flow delivered by Baltimore County's Gwynns Falls sewershed. The Main GF Interceptor's tributary area consists of approximately 2.9 square miles of primarily park areas and approximately 262,000-lf of sewer.

The **Powder Mill Interceptor (PM)** serves the northern portion of the sewershed, extending from the High Level sewershed boundary to the City boundary with Baltimore County. The PM Interceptor serves one of the more densely populated areas within the Gwynns Falls sewershed. The tributary area includes approximately 188,000-lf of sanitary sewers serving approximately 2.2 square miles of primarily residential development. The PM Interceptor discharges into the main Gwynns Falls Interceptor at the northern most point of the main interceptor.

The **Forest Park Interceptor (FP)** serves the northeast portion of the sewershed south of the Powder Mill sub-sewershed. The FP Interceptor extends from the High Level sub-sewershed boundary to the main Gwynns Falls interceptor. The FP Interceptor serves one of the more densely populated, as well as one of the earliest developed, areas within the Gwynns Falls sewershed. The tributary area includes approximately 116,000-lf of sanitary sewers serving approximately 1.3 square miles of primarily residential development. One of the two combined sewer system areas identified by Appendix B of the Consent Decree is located within the FP sub-sewershed. Under the Paragraph 8 projects (reference Sanitary Contracts 780, 782, and 813 in Section 2.2), the combined sewer was divided into separate storm water and sewer systems. The previous operation of a combined collection system explains the significant number of engineered combined sewer overflows (CSOs) eliminated by the Paragraph 8 projects.

The **Walbrook Interceptor (WK)** serves the eastern portion of the sewershed, extending approximately 6,000-lf in length by the High Level sewershed boundary. The WK Interceptor serves a densely populated area, as well as one of the earliest developed areas within the Gwynns Falls sewershed. The tributary area includes approximately 44,000-lf of sanitary sewers serving approximately 0.5 square miles of primarily residential development. The WK sub-sewershed contained the second of the two combined sewer system areas identified by Appendix B of the Consent Decree. The Paragraph 8 projects (reference Sanitary Contract 827 in Section 2.2) included the division of the combined sewer into separate storm water and sewer systems. The combined collection system explains the prior existence of one CSO eliminated by the Paragraph 8 projects.

The **Dead Run Interceptor (DR)** system is a dual interceptor arrangement which serves the mid-western portion of the sewershed. The DR Interceptor extends from the City boundary with Baltimore County to the main Gwynns Falls Interceptor. The DR Interceptor conveys a considerable percentage of the Baltimore County flow contribution to the sewershed. The tributary area includes approximately 78,000-lf of sanitary sewers serving approximately 1.4 square miles of a moderately populated area which comprises considerable park zones. The dual DR Interceptors were rehabilitated as part of the Consent Decree Paragraph 8 projects (reference Sanitary Contract 825 in Section 2.2).

The **Maidens Choice Interceptor (MC)** serves the south western portion of the sewershed. The MC Interceptor extends from the City boundary with Baltimore County to the Maidens Choice Pressure Sewer, which runs through the Low Level sewershed. The MC Interceptor conveys a considerable percentage of the Baltimore County flow contribution to the City's sewershed. The tributary area includes approximately 177,000-lf of sanitary sewers serving approximately 2.6 square miles of a moderately populated area which comprises some park zones. The MC Interceptor was rehabilitated as part of the Consent Decree Paragraph 8 projects (reference Sanitary Contract 826 and 827 in Section 2.2).

The **Maidens Choice Pressure Sewer (MCP)** receives the sanitary sewer flow conveyed by the Maidens Choice (MC) Interceptor at the southern boundary with the Low Level sewershed. At the connection between the MC and the MCP the Primson Avenue diversion structure allows sanitary sewer flow to be diverted either to the Low Level sewershed, which in turn discharges to the Back River WWTP, or to the South West Diversion via the MCP, which in turn discharges to the Patapsco WWTP. The MCP extends approximately 5,100-lf from the Gwynns Falls/Low Level Sewershed boundary to the South West Diversion.

The **South West Diversion Interceptor (SWD)** is an 8 mile pipeline located in the Southwest corner of the City. Specifically, the SWD begins at the Baltimore Street Diversion Chamber, located at the intersection of Baltimore Street and Ellicott Drive, and terminates at the Patapsco WWTP. With pipe diameters in the range of 78 inches to 102 inches, this pipeline conveys average flows between 40 and 50 MGD collected from Baltimore City, Baltimore County, Anne Arundel County and Howard County. It was constructed between 1974 and 1976 and its materials consist of pre-stressed concrete cylinder pipe (PCCP), meeting the requirements of the AWWA C301-72- Embedded Cylinder Pipe, and reinforced concrete pipe (RCP). The SWD is a passive pressure sewer that, under dry weather flow, operates under open channel conditions at high points along the sewer. Future rehabilitation work is scheduled for the Southwest Diversion Pressure Sewer under sanitary contracts (SC) 866 and SC867, as shown in figure 1.4.3.

The **PA-13 Sub-Basin and Westport Pump Station Main** are located within the Patapsco sewershed and are part of the Gwynns Falls Sewershed Study because all sanitary sewer flow produced within the sub-basin is discharged to the South West Diversion and not to the Patapsco sewershed. PA-13 serves an industrial tributary area including approximately 16,000-lf of sanitary sewers. The Westport Wastewater Pump Station is located at the intersection of Waterview Avenue and Cherry Hill Road; its construction took place in 1980 and was rehabilitated in 2004 under City of Baltimore Sanitary Contract 794.

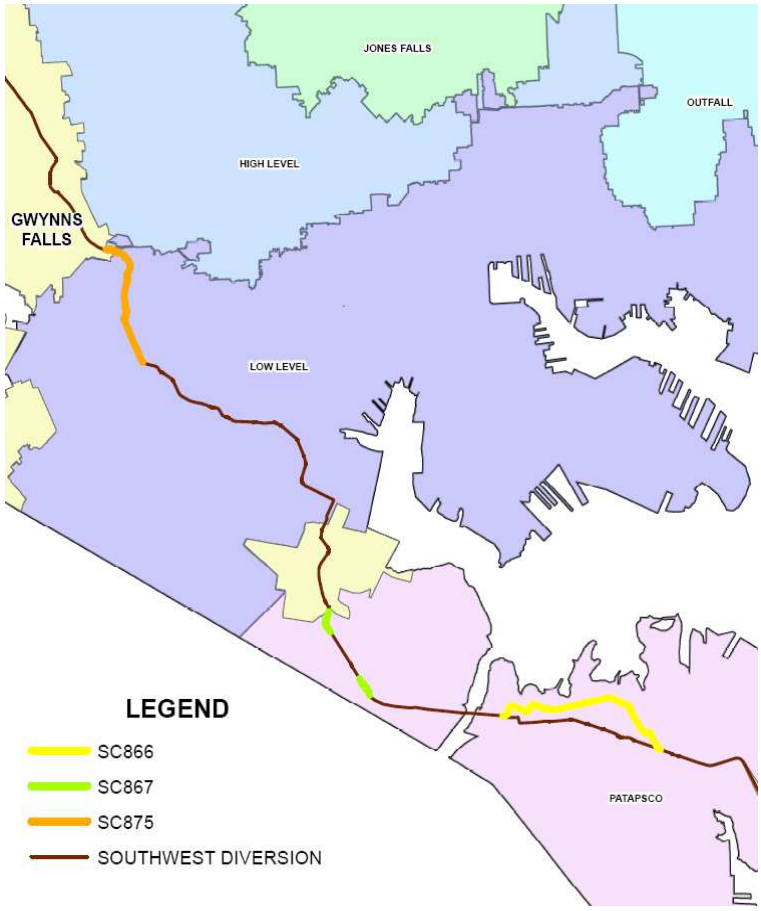

Figure 1.4.3 – Future Contracts

1.5 Collection System Components and Attributes

The wastewater collection system components that are included in this sewershed evaluation include:

i. Gravity sewers that are 8-inch diameter and larger
ii. Sewer appurtenances including manholes, junction chambers, siphons, etc.
iii. Westport Wastewater Pumping Station
iv. Westport force main

The Westport Wastewater Pumping Station, located at the intersection of Waterview Avenue and Cherry Hill Rd, was originally constructed in 1980 and was rehabilitated in 2004 under City of Baltimore Contract 794. The current station configuration includes the following pertinent attributes:

i. Three dry pit submersible wastewater pumps with constant speed control. Each pump has a capacity of 815 gpm at 82 feet total design head (TDH)/30 horsepower motor.
ii. Primary design point consisting of two pumps operating at 1,630 gpm/80 feet total design head.
iii. Estimated wet well storage time of 4 hours at typical flow rates.

The associated force main was constructed under SC538 & SC612 in 1980 and consists of approximately 250-lf of Class 54 Ductile Iron pressure pipe. The force main leaves the pump station, crosses under Waterview Avenue where it then discharges into the Southwest Diversion. No known rehabilitation work has been performed on the force main. Section 4.7 provides a summary of the force main condition assessment completed for this report.